

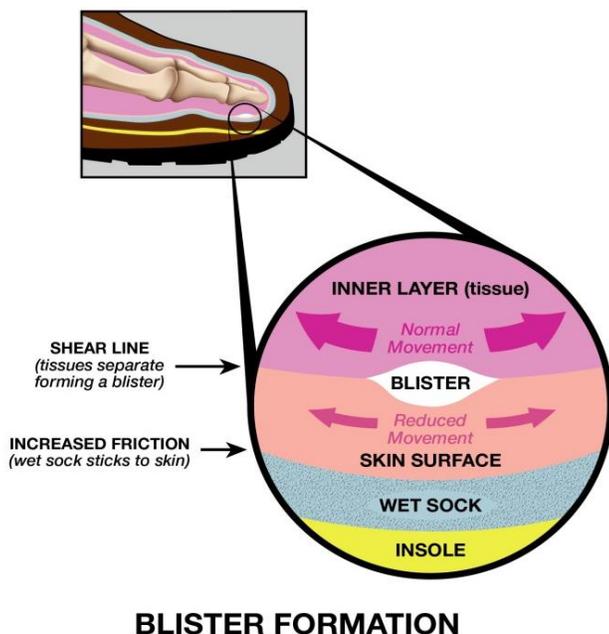


What are blisters?

Blisters are fluid-filled sacks of skin that can be caused by burns (e.g., heat, electrical, chemical), cold injuries, insect bites, acute trauma (pressure), or repeated rubbing (friction) of the skin. *Friction blisters* are the most common type of blister and one of the most common injuries in the military. They typically form on the toes, feet, and ankles but can also occur on the hands or other places where there is repeated rubbing (such as on the torso from the straps of a heavy backpack).

How are blisters caused?

Friction blisters form when an object (such as a glove or sock/shoe) is repeatedly moved across the skin with enough force to cause the layers of skin to release heat. The heat causes redness and a separation (or 'cleft') between the outermost layer of the skin (stratum spinosum) and rest of the epidermis. The cleft fills with serum-like fluid causing a raised area on the skin.



Why are blisters a concern for the Army?

Though often only causing minor discomfort, blisters can become severe enough to temporarily restrict a person's physical activity including training and job duties. In some cases, friction blisters have developed into serious complications and infections requiring antibiotics and medical treatment. As one of the most common injuries among active duty military, blisters present a notable adverse impact to military readiness.



Image: DOD Imagery

What increases risk of blister injuries?

Activities such as marching and running are the most common causes of blisters in the military. There are also individual risk factors that appear to increase both the likelihood and the severity of a blister. The more risk factors you have, the higher your chance of developing a blister. Potential risk factors identified in scientific studies are listed below. Consider your risk factors when choosing prevention tactics (*next page*).

- Wearing cotton socks
- Having moist sweaty skin
- Having no foot arch or flat feet
- Being of an ethnicity *other than* African American/Black
- Tobacco use (includes smokeless)

How can blister injuries be prevented? †

Various “best practices” for preventing blisters are recommended by medical professionals and professional and amateur athletes. However, there is limited scientific evidence supporting the effectiveness of most tactics when studied among large populations. Though current science may be too weak to validate the effectiveness of several of these measures, you may wish to consider trying some of the tactics below to determine what works best for your own activity.

Prevention tactic	Description
<p>SOCKS: Use synthetic moisture wicking blends (no cotton)</p>	<ul style="list-style-type: none"> There is fairly good scientific evidence that, compared to cotton socks, synthetic socks made from acrylic, nylon, or polyester that ventilate and wick moisture away from the feet can prevent blisters, especially during long distance marching or running. Some people advocate wearing a double layer of socks (non-cotton), as a second layer stops the first from rubbing against the skin. However, others prefer a single layer loop-stitched sock, as less heat is generated than with 2 layers. Scientific evidence does not clearly indicate which is best – this may vary with individual risk factors.
<p>ADAPTATION: Start slowly and build up to activity and equipment</p>	<ul style="list-style-type: none"> To help skin become more resistant to blistering, the duration and intensity of blister-causing activities should be increased slowly over time. Also, use the same shoes, gloves, or load weight/shape as you increase activity. This scientifically proven tactic helps prevent various injuries.
<p>SHOES: Ensure proper fit and maintenance</p>	<ul style="list-style-type: none"> Minimizing contact between your foot and shoe to reduce the risk of blisters. Make sure toes do not touch end of shoe while walking, and consider a wide toe box with room for toes to wiggle. Since foot size may swell half a size throughout the day or after activity, strive to purchase shoes when feet are most swollen. Additional best practice guidelines include ensuring proper shoe care to minimize rubbing. For example, do not leave shoes/boots on radiators or near heaters as this can cause them to shrink and seams to protrude.
<p>TAPING AND SKIN COVERINGS: Specific products to stick with you for hours</p>	<ul style="list-style-type: none"> Certain skin coverings have been shown to help absorb friction during movement which can reduce blister occurrence or severity.^{1,2,3} [NOTE: though Bursatek®, Dr. Scholl's Moleskin Plus®, and Band-Aid® are cited in studies, similar products may be comparable] Zinc Oxide tape has been anecdotally reported in running communities to prevent blisters from forming or minimizing further injury to an existing blister. Other products referred to as “blister plasters” will expand in response to friction and thus protect the area from blisters forming or getting worse.
<p>INSOLES</p>	<ul style="list-style-type: none"> A closed-cell neoprene insole was found to reduce the incidence of blisters in U.S. Coast Guard recruits.^[NOTE: Though Spenco® insoles were studied, comparable products are expected to have similar effects] Anecdotal reports suggest proper fitting insoles can reduce certain blisters, though ill-fitting insoles can also cause them.
<p>COATINGS: Reduce friction with various coating products</p>	<ul style="list-style-type: none"> Inexpensive products used to coat areas to reduce friction and prevent chafing and blisters have been commonly advocated by various athletes to prevent blisters on feet, under arms, bra straps, or between legs. While previous study suggests antiperspirants may reduce blisters, there is a risk of skin irritation so this tactic is not specifically recommended here. Potentially less irritating coatings include products such as Vaseline® or of more recent popularity, longer lasting non-oily coatings such as BodyGlide®. While many anecdotal reports suggest these products may prevent blisters without causing skin reactions, no scientific study has validated these products' effectiveness.

† Use of trademarked names does not imply U.S. Army endorsement, but is intended to assist in identification of specific products.

Information sources:

- 1) Knapik J.J., “[Friction Blisters: Pathophysiology, Risk Factors, and Prevention](#)”, American Academy of Orthotists and Prosthetists: 34th Annual Meeting and Scientific Symposium, February 27- March 1, 2008.
- 2) Knapik J.J., 1999. “Risk Factors for Foot Blisters during Road Marching: Tobacco Use, Ethnicity, Foot Type, Previous Illness, and Other Factors”, *Military Medicine*, Vol. 164, No. 2, pp. 92-97.
- 3) Knapik J.J., 1995. “Friction Blisters: Pathophysiology, Prevention, and Treatment”, *Sports Medicine*, Vol. 20, No. 4, 136-147.
- 4) <http://www.webmd.com/skin-problems-and-treatments/tc/blisters-prevention>
- 5) <http://www.running-physio.com/blisters/>
- 6) <http://www.sportsinjuryclinic.net/sport-injuries/foot-heel-pain/blisters>